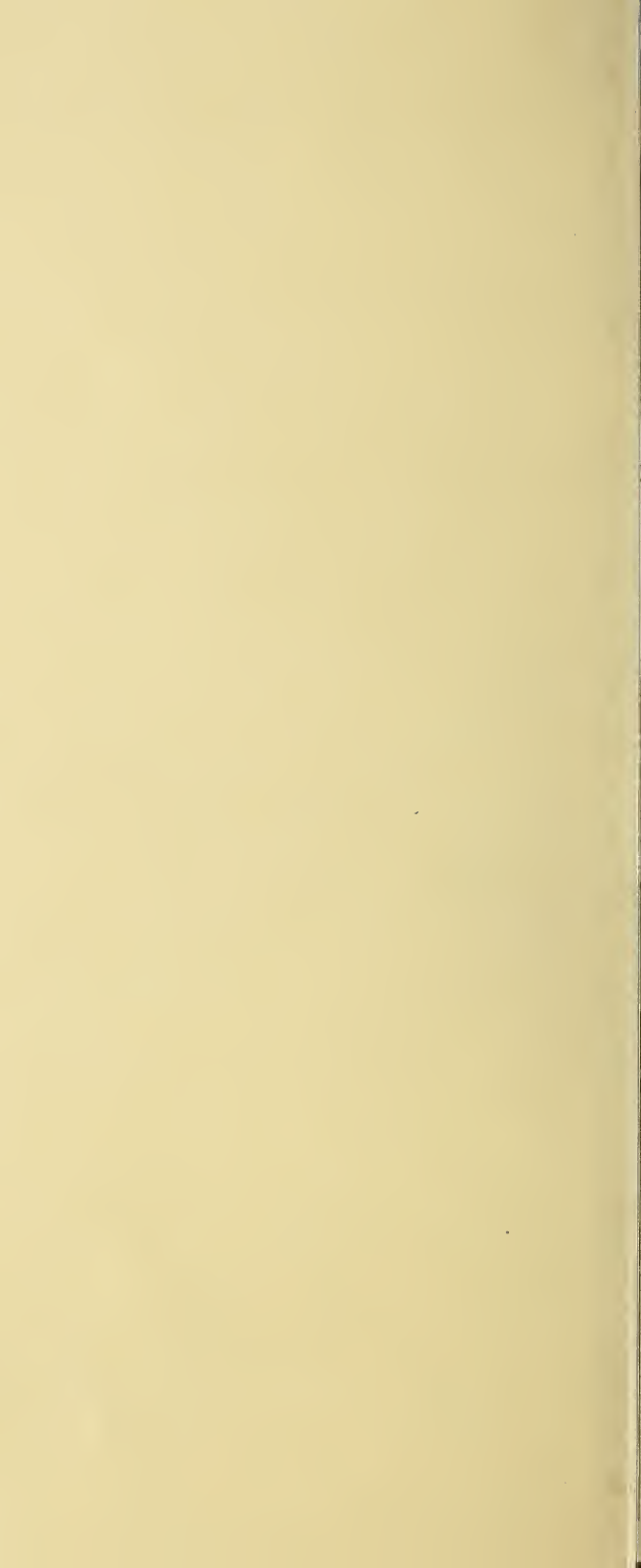


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Forest Hydrology Research at Oxford



Tying water quality and quantity
to forest practices on the
Southern Coastal Plain pinery.

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**Southern
Forest
Experiment
Station** 

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Coastal Plain, which extends from Virginia to east Texas.

With that job successfully completed, Oxford scientists have a concern today that is closely related: water quality and quantity.

The Nation's increasing demand for southern pine is leading to more intensive forest management to realize the maximum amount of wood from every acre. Some of the harvesting and regeneration practices can result in increased sediment and nutrient loss. How much we don't know. It's the job here to find out how forest management practices affect southern streams. Again, the territory is the entire southern Coastal Plain.

One objective here is to develop scientific data upon which practical water quality standards can be based. The ultimate objective is to develop the ability to predict effects of various forest practices on water quality and quantity. With these facts in hand, the forest manager can choose among alternatives needed to protect water quality and to meet his particular needs.

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Preparing samples for nitrogen and phosphorous analysis

First, what is the quality of water produced by undisturbed forests?

By law, the Environmental Protection Agency requires that the States set water quality standards for their waterways, but little scientific data are available to help them. First, we must get data from undisturbed watersheds. This information is necessary to measure changes due to forest practices, and to establish realistic water quality standards. Obviously, if the standards set are more stringent than now being met by undisturbed pine forests, most forestry practices would be halted. Studies at Oxford have revealed some interesting results. For example:

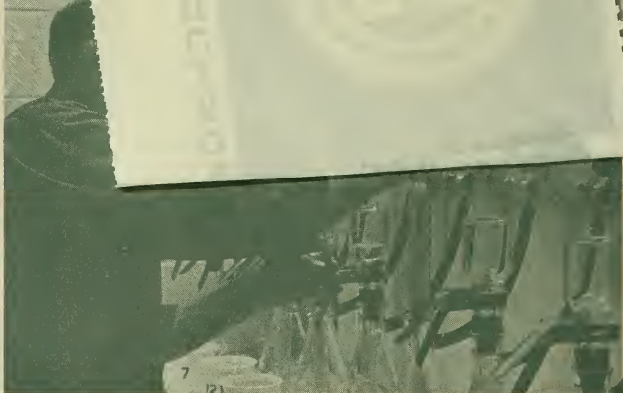
1. Sediment is the primary water pollutant in the South and accounts for much of the nutrient losses, especially nitrogen, phosphorous, and potassium.

2. Undisturbed pine forests produce average annual concentrations of less than 20 pounds of sediment per acre-inch of stormflow. By comparison, eroded lands may produce up to 20 *tons* of sediment per acre-inch of flow before they are planted to pine. Further, such recovery can be achieved in less than 15 years.

3. More nutrients are added by rainfall each year than are lost to stormflows from undisturbed forest lands.

4. Sediment concentrations in streams can't be wholly attributed to activities on forested slopes. Several miles of channel may contribute as much sediment as a 1000-acre forested watershed. In fact, studies show that the contribution of sediment in many southern streams from stream-bank and channel erosion alone may exceed proposed water quality standards.

5. Undisturbed pine forests will at times produce water that does not meet proposed water quality standards. Time and sequences of stormflow events are important factors.



Testing sediment concentrations through vacuum filtration

They Came to Heal the Land

The Southern Forest Experiment Station sent its first scientists to Oxford, Mississippi in 1946 to help stem the erosion crisis facing the Yazoo and Little Tallahatchie River watersheds. Pioneer research here on planting loblolly pine to halt erosion has led to the rehabilitation of more than a half-million acres of eroded and gullied land on the Y-LT. And these results have found wide applicability across the southern Coastal Plain, which extends from Virginia to east Texas.

With that job successfully completed, Oxford scientists have a concern today that is closely related: water quality and quantity.

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Weighing pine needles to determine reduction of litter after a thinning operation

How do forest practices affect water quality and runoff?

1. Evidence suggests that total impact of clearcutting may not be any worse than silvicultural systems that include more frequent cutting. Where temporary roads are the primary sediment source, reopening them frequently could have a greater impact.

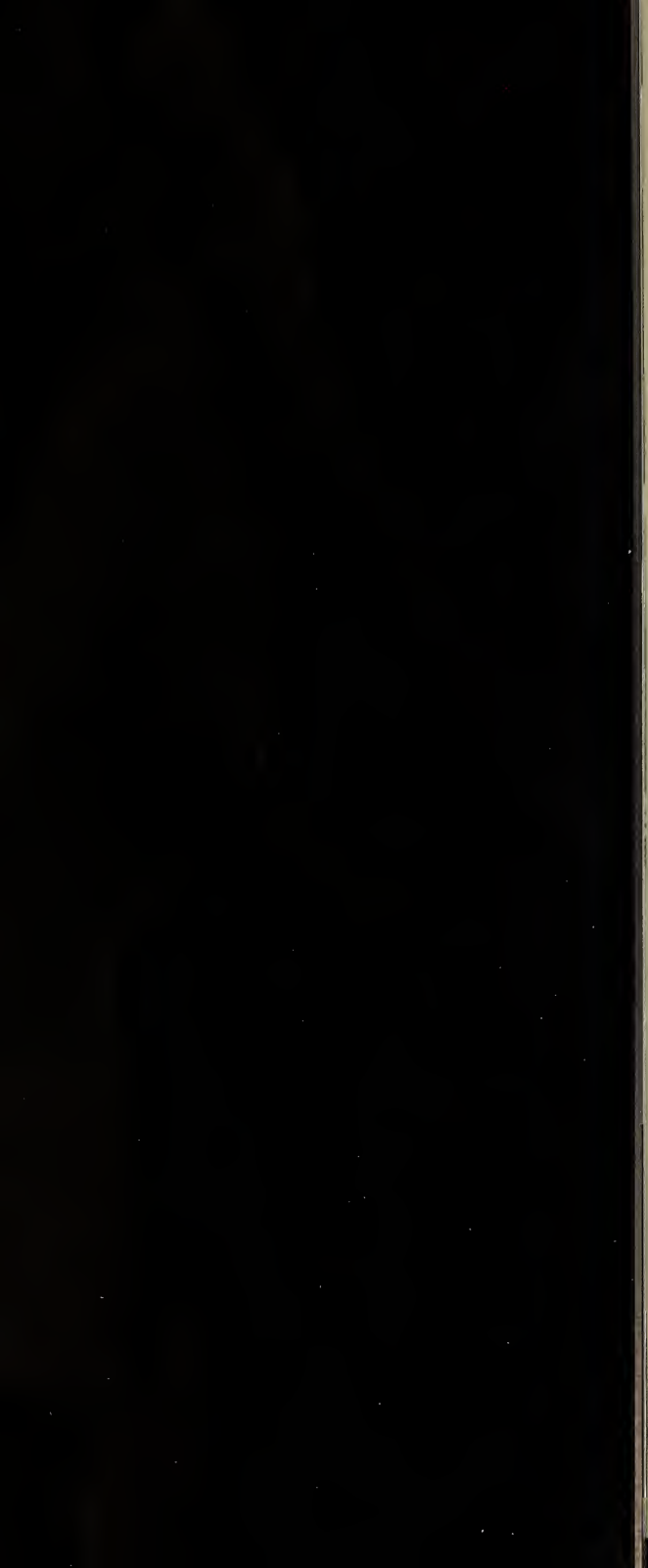
2. During a harvest, skidding causes the most serious soil disturbance. Even so, in one study, soil loss from skid trails did not seriously impair water quality because they occupied only a small percentage of the watershed. Too, soil movement from skid trails during the second year — after vegetation had invaded the trails — was reduced to one-fifth the first-year level.

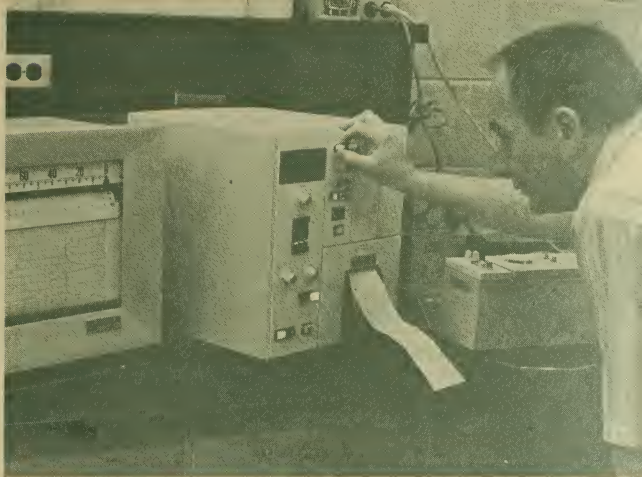
3. Using common-sense practices when clearcutting small watersheds of loblolly pine in west Tennessee, scientists found that sediment concentrations were similar to those produced by watersheds of undisturbed low-grade hardwoods.

4. Deadening low-grade hardwoods and planting pine reduced average annual stormflows 50 percent, sediment concentrations 77 percent, and annual sediment yields 75 percent from small watersheds, starting with the fourth year after treatment.

5. Forest managers can influence streamflow or ground-water recharge, and thereby water quality, by regulating species and tree populations. With favorable soil situations, lower tree densities and frequent cuttings can increase water yield where and when it is needed.

6. Mechanical methods of site preparation tested so far increased sediment concentrations and greatly increased first-year stormflows, with no appreciable difference noted among the various methods. Studies are being continued to find suitable alternatives of site preparation that will meet water quality criteria.





Innovations in Experimental Methods. Reliable data depend upon complete control of sampling and analytical procedures. Here at Oxford, new techniques have been devised to improve the field and laboratory methods. For example, a new automated analytical technique has been developed which will accurately measure phosphorous concentrations as low as one part per billion.

Southern Coastal Plain



Measuring stormflow from pine watershed



Collecting rain water under trees and in open to determine the amount intercepted by the crowns

About the Station

The Southern Forest Experiment Station is one of 9 regional forest research organizations operated by the U.S. Forest Service. One of the oldest yet dynamic institutions of its kind in America, the Southern Station serves a seven-state region which contains one-fifth of the nation's commercial forest land and one-tenth of its timber. It is also responsible for tropical forestry research in Puerto Rico. Briefly put, its mission is to increase the usefulness of the region's forests . . . by increasing timber growth, wildlife habitat, forage for livestock, recreation opportunities . . . and improving water quality. While pursuing studies which will improve forest management, the Station is equally concerned with extending the wood supply by better utilization of existing forest resources.

